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where the problems of instruction are less varied, such remarks have even less justification. The qualities that make a successful teacher, in any environment, are high character and wide knowledge; and a very few years trial should suffice to inform the discerning and disinterested judge whether or not a man possesses these essentials. If he does not there is no justification for retaining him, no matter how much money or inconvenience is saved by doing so. If he does there is no justification for removing him, no matter how much money doing so releases for other purposes, or how much the administration believes in his incapacity, so long as it has no other evidence of it to offer to the public except vague general statements about environmental unfitness, and having reached the limit of growth. Such statements are based altogether too much on personal opinion and on intangible, esoteric considerations to justify action so serious in its consequences as removal from an academic position always is.

SIDNEY GUNN

MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY,  
July 3, 1911

#### ACADEMIC AND INDUSTRIAL EFFICIENCY

TO THE EDITOR OF SCIENCE: Referring to Mr. Handschin's letter concerning academic and industrial efficiency in your issue of June 9, I feel that it should be said that it is very doubtful whether the efficiency of educational institutions can be compared in any way with the efficiency of industrial concerns.

I very much doubt the unsupported thesis: "But the institution which pays the most to 'productive' labor is the most efficient." If a railroad were to be built by hand labor the labor cost would be relatively high, but I fancy no one would say that the work was efficiently done. Indeed, it may be stated with almost no other support than our general knowledge of things that in proportion as new machinery is devised to take the place of hand labor the efficiency of production is increased.

In general, efficiency, as the word has been recently used, is the ratio of useful energy of one form recovered to total energy of another form supplied or destroyed. I should like to inquire who can measure the total energy supplied by a teacher or the useful energy recovered?

Without question there are certain economies that may be realized in the conduct of an educational institution of any kind, but, while these economies must not be overlooked, they are the least important of all of the items to which attention should be given. In most of the discussion that has appeared it has seemed to me that the duties of the college and the university have been confused. Whatever may be the dictionary definition of a university, it is accepted as a place for research, a place where enthusiastic men may find encouragement and the means to assist them in their efforts to increase the world's store of knowledge. It is not necessarily an aggregation of colleges—it is not a commercial laboratory. Its duty, therefore, is to promote research with only so much control by a group of scholars as to make it reasonably certain that any study undertaken is worthy of effort. It is the duty of a college to give young men and young women a certain small proportion of knowledge already available, to teach them where and how to get more, and to endeavor to inspire them with a high sense of duty to their country, their neighbors, themselves and their God. This is as we know the college in America.

In its mechanical or commercial sense efficiency is not a word to be used in connection with this duty of the college, or the work of a university. The cost matters little if the duty and work are well performed.

I would not have this statement considered as a reflection upon the excellent report of Mr. Cooke to the Carnegie Foundation for the Advancement of Teaching, which report seemed to me to be full of suggestions of great value.

WM. G. RAYMOND

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